3.4.3. Lane Ambiguity Resolution

3.4.3.1 Purpose

The purpose of this test is to evaluate the response of the OMEGA system to erroneous operator inputs of aircraft position.

3.4.3.2. General

As described in the OMEGA theory section, OMEGA lanes are ambiguous every 1/2 wavelength of the OMEGA LF RF. For the 10.2 KHZ signals, this means the lanes are ambiguous every 8 nm. The ambiguity can be mitigated, through analysis of several of the frequencies, to an ambiguity of approximately 144 nm. Most modern airborne OMEGAs use this technique. In most OMEGAs, inputing a new initial position will cause the OMEGA to begin anew the initialization process, the length of which will partially be based upon the accuracy of the input position. The process will be assumed complete when the OMEGA posts an operator alert that the system is navigating.

3.4.3.3. Instrumentation

A stop watch and data cards are required for this test, a voice recorder is optional.

3.4.3.4. Data Required

For each erroneous own aircraft position input to the OMEGA, record the input error, time for an initialized discrete to be posted, INS displayed latitude and longitude and OMEGA displayed latitude and longitude.

3.4.3.5. Procedure

Prior to the test flight, determine the latitude and longitude at which the test will be conducted. The test will be performed using errors in north-south and east-west positions of + 5, 10, 20, 40, 80, 110 and 150 nm. Convert the nm errors to latitude and longitude errors using equation (26). The INS will be used for a comparison with the OMEGA derived position. To correct for INS drift prior to the test, the INS must be updated using the OMEGA derived position. Next add the latitude and longitude errors to the displayed OMEGA position, enter this new latitude and longitude as an OMEGA initialization position and start the stop watch. Record the elapsed time and INS displayed latitude and longitude when the system discrete indicating a navigating OMEGA is displayed. Without updating the INS, repeat for the 10, 20, 40, 80, 110 and 150 nm errors. If a discrete is not displayed after 5 minutes[9] from initialization following any of the erroneous inputs, discontinue the test. No larger errors will then have to be applied.

3.4.3.6. Data Analysis and Presentation

Most modern OMEGA systems are designed to resolve errors of up to 144 nm. The maximum error in initial position which the OMEGA can tolerate and still successfully initialize is bounded between the last successful error input and the failed input. The latitude and longitude of the INS and OMEGA at the time the operator alert is posted should be consistent with the expected errors determined from the OMEGA and INS dynamic aircraft tests. Relate the range of the erroneous inputs resulting in an initialized OMEGA to the possibility of having to reinitialize the OMEGA following a power or system failure and the requirement for an accurate navigational aid following this failure. The presence of a ready discrete with a significant split between the INS and OMEGA derived position should be related to the degraded accuracy and subsequently degraded ability to complete the mission and to safely recover the airplane due to position fixing errors. The halted initialization or degradation of accuracy can be related to the requirement for finding the target or an airfield to land during IMC conditions.

3.4.3.7. Data Cards

A sample data card is provided as card 46.

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[9] May be adjusted for individual systems.

CARD NUMBER ___ TIME ___ PRIORITY L/M/H

LANE AMBIGUITY RESOLUTION

[PERFORM AN OMEGA UPDATE OF THE INS, INPUT THE OMEGA ERRORS, START THE STOPWATCH AND WAIT FOR A NAVIGATION READY DISCRETE. RECORD DATA. REPEAT UNTIL THE DISCRETE IS NOT PROVIDED AFTER 5 MIN.]

LAT	LONG	TIME	INS POSIT	OMEGA POSIT

NOTES:

Card 46: Lane Ambiguity Resolution Data Card